**Heat resistance test**

Purpose: to make sure the product behaves the same in environments of varying temperatures that it is likely to encounter. Test measures for change in size that may occur as the product is heated.

Materials

* Product
* T-shirt dryer
* Heat sensor
* 3 sheets of paper
* Ruler
* Writing utensils

Procedure

1. Obtain the materials.
2. Take the product and draw an outline of it on a piece of paper.
3. Use the ruler to measure the length of the traced product, and make three marks at of the length, points A, B and C respectively.
4. Measure the width of the product at the marked points, and record the values in the chart.
5. Turn on the t-shirt drier, set to 4th heat setting, and belt speed of 4.
6. Place the product on the belt and allow it to go through.
7. Use the heat sensor to observe the range of temperature the product goes through.
8. Once the product comes out the other side, place it on the back of the sheet of paper, and outline again.
9. Use the ruler to measure the length of the product, and make three marks at of the length.
10. Measure the width of the product at the marked points, and record the values in the chart.
11. Repeat steps 2-10 changing the heat setting in step 5 to 6th and 8th.

For a successful product, no changes in the product should occur within the test. The temperature range accounts for asphalt or sand in the summer that are known to reach temperatures up to 140 degrees Fahrenheit.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Degrees (F) | Point A (cm)  Before After | | Point B (cm)  Before After | | Point C (cm)  Before After | | Length (cm)  Before After | |
| 140 | 9.5 | 9.5 | 7.5 | 7.5 | 6 | 6 | 26.5 | 26.5 |
| 170 | 9.5 | 9.5 | 7.5 | 7.5 | 6 | 6 | 26.5 | 26.5 |
| 200 | 95 | 9.5 | 7.5 | 7.5 | 6 | 6 | 26.5 | 26.5 |

**Flexibility test**

Purpose: to test that the product has flexibility to ensure that the user experiences comfort when using the product.

Materials

* Protractor
* Ruler
* Marker
* Tester product

Procedure

1. Use the ruler to measure the length of the product, and make three marks at of the length.
2. Set the product flat on a surface and place the protractor against it at the first mark.
3. Fold the product at the mark to 60 degrees, 120 degrees, and 180 degrees
4. Observe if the product cracks, or disfigures; note the results in the chart.
5. Repeat step 3 for marks of the product.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Observations | | |
| Degrees | 1/3 Mark | 1/2 Mark | 2/3 Mark |
| 60 | The fold did not produce any changes in the product | The fold did not produce any changes in the product | The fold did not produce any changes in the product |
| 120 | Returned to its normal shape; no changes | Returned to its normal shape; no changes | Returned to its normal shape; no changes |
| 180 | The product was slower to return to its normal shape, slight crease present, but there were no permanent changes | The product was slower to return to its normal shape, but there were no permanent changes | The product was slower to return to its normal shape, but there were no permanent changes |

**Water Absorption Test**

Purpose: To test whether or not our product absorbs water while submerged in it for different periods of time.

Materials

* 4 tester products
* Room temperature water
* 15 quart container
* Towels/Napkins
* Timer
* Scale

Procedure

1. Gather all lab materials.
2. Pour water into bucket and fill to about one inch of height.
3. Weigh the product.
4. Place the product into the bin and submerge in the water.
5. Wait 1 minute while letting the product soak in the water.
6. Remove the product after the 1minute and dump out any water inside. Wipe it down dry.
7. Measure the mass and note the difference.
8. Repeat steps 3-9 with new products changing the time the product is submerged in water from 1 minute to 5, 10, and 60 minutes.
9. Place all lab materials back.

\*Note: if the product absorbs water leaving insufficient amounts for the next test, it is necessary to fill the container again.

|  |  |  |
| --- | --- | --- |
| Time in water (min) | Starting Mass (g) | Ending Mass (g) |
| 1 | 29.0 | 29.0 |
| 5 | 28.9 | 28.9 |
| 10 | 29.1 | 29.1 |
| 60 | 29.0 | 29.0 |

**Multiple Surface Tests**

Purpose: to test how different surfaces will affect whether or not the gum sticks to the gum shield.

Materials

* Tester product with shoe
* Orbit gum sticks
* 120-140 lb volunteer
* Surfaces
  + Concrete block
  + Carpet patch
  + Tile
  + Brick
  + Grass patch

Procedure

1. Gather all lab materials.
2. Chew piece of gum for 5 minutes.
3. Place gum on concrete block.
4. Have a person put on the shoe with the product, leisurely walk, and step on the gum.
5. Note whether the gum stuck to the gum shield or not.
6. Repeat steps 2-5 with the other four surfaces.

|  |  |  |
| --- | --- | --- |
| Surface Type | Gum Stuck to Product  Yes No | |
| Concrete | X |  |
| Carpet | X |  |
| Tile | X |  |
| Grass | X |  |

1. Place all lab materials back.